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Noise Barrier Social Impact Study:

Highway 401
Between Don Valley Parkway
and Victoria Park Avenue



Ontario

Ministry of
Transportation and
Communications

Research and
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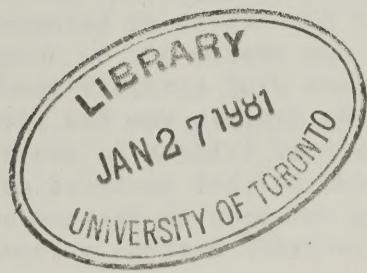
Highway 401
Between Don Valley Parkway
and Victoria Park Avenue

Government
Publications

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March 1980



The contents of this report reflect the views and opinions of the authors, and not necessarily those of the Ministry.



Ministry of
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STUDY BACKGROUND

In an effort to help improve the general quality of life of residents living in close proximity to freeways, the Ministry of Transportation and Communications has been constructing noise barriers in selected locations throughout Ontario. The objective of these barriers has been to reduce the effect of noise and other freeway annoyances.

This study was undertaken to determine public reaction to the 4m Durisol noise barrier, installed on the south side of Highway 401 between the Don Valley Parkway and Victoria Park Avenue. The survey was conducted one year after the barrier was constructed. In previous surveys, emphasis was placed on residents' reaction to noise barrier impact on dissatisfaction with freeway annoyances. The intention of this study was not only to obtain information on the effects of the noise barrier but to increase the focus on public reaction to, and perception of barrier aesthetics.

Many of the results presented in this study will enable a direct comparison to previous social surveys conducted in Ottawa and Toronto. Of particular significance, in comparison to the Ottawa and Toronto (Etobicoke) sites, the Don Valley Parkway-Victoria Park Avenue site is intermediate in terms of noise levels and may present unique results. The survey also provided social assessment of a third barrier material, concrete, and enabled a comparison with previous results Ottawa-wood and Toronto-steel. In fact, the noise barrier in question is the first barrier in Ontario with an absorptive surface (Dursol).

This study was requested and funded by the Environmental Office and carried out by the Drivers and Vehicles Research Office. The work was conducted under the guidance of a committee consisting of:

Doug McFarlane	- Environmental Office
John O'Grady	- Environmental Office
Jack Wear	- Highway Design Office
Brian Deslauriers	- Drivers and Vehicles Research
Paul Gorys	- Drivers and Vehicles Research

Results of sound level measurements quoted in this report were verified by Jerry Hajek of the Acoustics Research Office and Michael Monette of the Highway Design Office.

The principal research was undertaken by James White and Anita Fallis of InfoResults Limited.

EXECUTIVE SUMMARY

Introduction

A durisol noise barrier was constructed on the south side of Highway 401 between the Don Valley Parkway and Victoria Park Avenue in 1978. The barrier, four metres high, was made from grey concrete. A survey to determine the residents' satisfaction with the barrier was conducted in 1979. The major areas investigated were: residents' satisfaction with various features of their neighbourhood; perceptions of the noise level before and after installation of the barrier; aesthetic reaction to the barrier; and perceived appropriateness and benefits of such noise barriers.

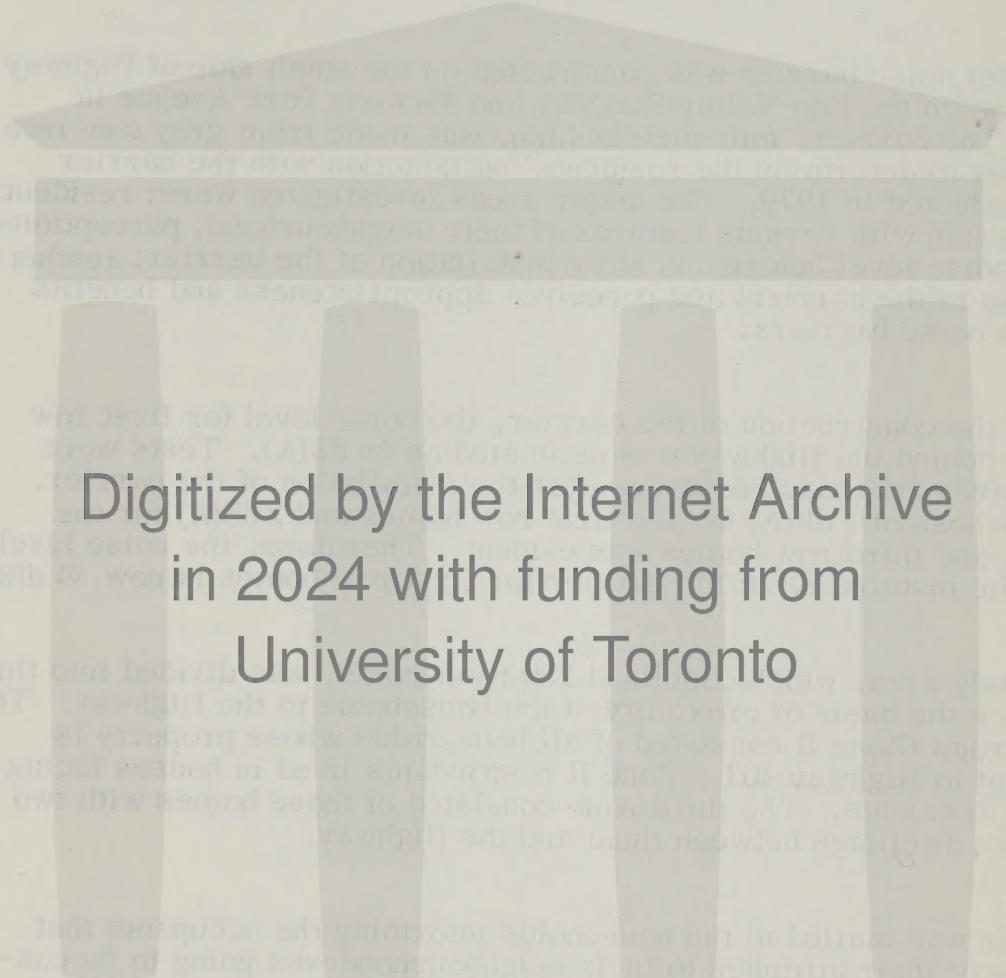
Before the construction of the barrier, the noise level for first row homes behind the Highway was estimated as 69 dB(A). Tests were undertaken for noise reduction after the installation of the barrier. A noise loss of 8 dB(A) for the first row homes and 2 dB(A) for the second and third row homes was evident. Therefore, the noise level after the installation of the barrier for first row homes is now 61 dB(A).¹

The study area, which contained 280 households, was divided into three zones on the basis of proximity of the households to the Highway. The first group (Zone I) consisted of all households whose property is adjacent to Highway 401. Zone II respondents lived in houses facing Zone I residents. The third zone consisted of those homes with two or more dwellings between them and the Highway.

A letter was mailed to the households informing the occupants that a study of their attitudes to their neighbourhood was going to be conducted. Personal interviews were conducted during the late fall of 1979. Up to four call backs were made to each household as needed to achieve the quota of 200 interviews. Approximately 10% of the interviews were verified to ensure their authenticity.

The data were analyzed by zone, by sex, and by length of residence. Further analysis was done on selected questions.

¹ L 50 -Unadjusted for traffic variation, 4 feet above ground.



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Research Findings

Sample

A total of 207 residents, representing 73.9% of the total households were interviewed. On a zone basis, almost two-fifths (39.6%) of the total sample lived in Zone I, 35.3% in Zone II, and 25.1% in Zone III.

Slightly more females (51.7%) than males (48.3%) were interviewed. The sex differences by zone were not statistically different. The respondents were classified into the following age groups: 18-24 years, 13.6%; 25-34 years, 23.3%; 35-44 years, 22.8%; 45-54 years, 30.1%; 55-64 years, 6.3%; and 65 years and older, 3.9%. No statistical differences were found among the six age groups by zone or by sex of the respondent.

The area appears to be stable in terms of mobility since over half (55.1%) of the respondents have lived in their house for 10 or more years. Twenty-two residents who moved into their house after the barrier was installed in September 1978 are referred to as short-term as opposed to long-term residents. No significant differences were found among zones by length of residence. The majority of the respondents own their home rather than rent, 93.2% vs. 6.8%, respectively. No statistical difference was found in ownership among the three zones.

Attitude To Neighbourhood

The respondents were asked to rate eleven neighbourhood features in terms of their degree of satisfaction with each feature. For analysis purposes, the 8-point scale was collapsed into three groups, namely: satisfied, neither satisfied nor dissatisfied, and dissatisfied.

Two-fifths (41.5%) of the respondents were dissatisfied with the amount of noise from the Highway when outside and almost one-third (30.5%) with the amount of noise while trying to sleep. Very few respondents were dissatisfied with the amount of noise while talking and reading or relaxing in-doors. These five features were not significantly different by zone.

Almost one-third (29.0%) of the respondents were dissatisfied with the amount of dust and dirt that settles on their yard, one-fifth with the amount of salt spray (19.3%) and fumes from the traffic (18.9%). Very few residents were dissatisfied with the amount of visual privacy from traffic on the Highway (4.4%) and vibrations caused by traffic on the Highway (9.7%). These non-noise related features were statistically related by zone. A greater percentage of Zone I than II or III were dissatisfied with the above features.

Another indication of the residents' attitude to their neighbourhood was whether or not they had considered moving from the area. One-third (31.9%) of all respondents had thought about moving. One-fifth (22.7%) of the respondents who considered moving mentioned the noise from the Highway as a reason for moving. Three people stated they had not moved because the barrier had reduced the noise level.

Perception of Noise Before Barrier

Just under two-thirds (62.7%) of the long-term residents considered noise a problem before the barrier was installed. The percentages by zone, which were statistically different, were: Zone I, 75.3%; Zone II, 51.6%; and Zone III, 58.3%. It appears that noise from the Highway limited the residents' use of their backyards and interferred with their sleeping.

Perception of Durisol Barrier

Two questions measured the residents' overall attitude to the barrier, namely, how satisfied they were with it and how worthwhile they considered it to be. Just over half (53.1%) of the respondents were quite, very or completely satisfied with the barrier, almost two-fifths (37.7%) were neither satisfied nor dissatisfied with the barrier and one-tenth (9.2%) were quite, very or completely dissatisfied. The level of satisfaction with the barrier did not vary significantly by zone, sex or age of the respondent.

The reasons for the expressed level of satisfaction were investigated. Although about half (51.2%) of the respondents said the barrier has reduced the noise level, over one-quarter (27.3%) stated the noise level was not reduced enough. One-fifth (21.7%) of the respondents reported the barrier had reduced non-noise related highway problems. However, one-tenth (11.6%) of the respondents were dissatisfied with the barrier because of the existence of non-noise highway problems, the appearance of the wall itself, the lack of property maintenance, and the increase in anti-social behaviour occurring on the residential side of the barrier.

One-third (34.3%) of the respondents reported the barrier had been very worthwhile and almost half (45.9%) said it was somewhat worthwhile. Overall, one-seventh (14.5%) did not consider the barrier worthwhile. More Zone I than II and III respondents considered the barrier as very worthwhile.

The majority of the long-term respondents (68.7%) expected the barrier to reduce or eliminate noise. Almost two-fifths (38.9%) stated that a noise reduction occurred after the erection of the barrier. The majority (76.6%) of the respondents who considered noise a problem before the barrier felt it had improved their problems somewhat.

The long-term respondents were asked to compare the situation now with the situation before the barrier was constructed in terms of a feature being better, unchanged, or worse. The respondents believe the effects of the barrier on their neighbourhood have been generally positive. Over three-fifths (61.6%) of the respondents said the overall situation was better now than before the noise barrier was put up. Two-thirds (66.0%) said the amount of traffic noise from the Highway was better, that is less, now; half (49.2%) reported less noise in some sections of their house; almost half (45.9%) have more visual privacy in their yard; over two-fifths (42.2%) less dust and dirt; and approximately one-quarter reported the situation concerning fumes from the highway traffic (27.5%), vibrations due to traffic (26.0%), and salt spray (23.3%).

The percentage of Zone I residents who reported the situation is better is considerably higher than for the whole sample. For example, seven out of eight of the Zone I residents believed the overall situation is better and only 1% say it is worse as a result of the barrier.

The respondents were asked if they received any unanticipated benefits from the noise barrier. Two-thirds (67.4%) of the long-term residents did not receive any unanticipated benefits. One-third of the respondents reported unanticipated benefits. The barrier has provided more privacy to the residents, especially those in Zone I than they had expected. It is interesting to note that 7.1% of the long-term residents mentioned noise as an unanticipated benefit. Most of the other benefits such as less dust and dirt, reduced salt spray and wind, etc. were mentioned by the Zone I respondents.

The barrier appears to have caused some problems for some of the residents, especially those living in Zone I. One-fifth (21.1%) of the long-term residents mentioned a problem. The two major problem areas involve the occurrence of anti-social behaviour and the lack of property maintenance.

Improvement To Durisol Barrier

The respondents were asked to provide suggestions as to how the durisol barrier could be improved from both the residential and highway sides. Almost two-thirds (63.3%) of the respondents suggested the government landscape the residential side by planting trees and shrubs. One-third (33.8%) believed the colour of the barrier should be changed. Those indicating a colour change preferred green, followed by brown. One-quarter (25.1%) suggested a higher barrier, one-fifth (19.8%) a thicker barrier, and 16.4% indicated a change in the design of the barrier.

Half of the respondents (50.8%) suggested landscaping would improve the barrier from the highway side and one-quarter (26.0%) indicated a colour change. One-third (32.4%) of the respondents did not make a suggestion.

Perception of Noise Barriers

One objective of the survey was to determine people's perceptions of barriers in general. Therefore, the issue of barrier type was further investigated by showing the respondents three different sets of photographs to determine their aesthetic, colour, and design preferences.

The first set of photographs contained pictures of a concrete, wood, and steel barrier. The second set of photographs consisted of four coloured walls, namely: medium brown, light grey, pacific turquoise, and gulf green. The last set had pictures of a horizontal, vertical, and fan shape barrier.

There appears to be a slight preference for the wood barrier in terms of overall appearance. Over one-third (35.8%) of the respondents chose it as the best liked compared to 30.4% and 28.5% who chose the concrete and steel barriers, respectively. However, in terms of effectiveness, over half (55.6%) of the respondents perceived the concrete barrier as the most effective.

Half (50.3%) of the respondents chose the horizontal barrier as the best liked in terms of design. In comparison, one-fifth chose the fan shape (22.2%) and vertical barriers (20.3%) as their first choice in design of barriers.

One-third (33.8%) of the respondents indicated medium brown was the best colour for noise barriers. One-fifth of the respondents each chose light grey (22.2%); gulf green (21.7%); and pacific turquoise (20.8%) as the best colour. However a greater percentage of the respondents (39.1%) chose light grey as least liked for a colour for noise barrier as chose green (23.7%), brown (18.4%) or turquoise

The respondents were asked what effect the barriers built along various sections of Highway 401 have on the highway and the area around it. Approximately twice the percentage of respondents (39.3%) stated noise barriers made the Highway less attractive than reported they made it more attractive (19.9%). One-third (34.5%) believed barriers had no effect on the appearance of the Highway.

The reasons given refer mainly to either the negative appearance of the barriers themselves or the negative effect of the barriers on the highway. Over one-quarter (28.5%) of the respondents stated barriers serve a functional purpose or that drivers do not and/or should not pay attention to barriers.

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INTRODUCTION

A durisol noise barrier was built on the south side of Highway 401 between the Don Valley Parkway and Victoria Park Avenue in November 1978. The Ministry of Transportation and Communications retained InfoResults Limited to conduct a survey to determine the residents' satisfaction with the barrier approximately one year after its completion. The major areas investigated were: residents' satisfaction with various features of their neighbourhood; perceptions of the noise level before and after installation of the barrier; aesthetic reaction to the barrier; and perceived appropriateness and benefits of such noise barriers.

This report consists of four main sections, namely: background, research methods, research findings and discussion. The first section describes a similar study on the impact of noise barriers in the Ottawa and Etobicoke areas and the results of acoustical testing on the durisol barrier. The research methods, including the sample selection, questionnaire design, data collection, and data analysis are presented.

The section on research findings is divided into the following sub-sections: sample characteristics; attitude to neighbourhood features; perception of noise before barrier; overall perception of durisol barrier; perception of situation after barrier installed; level of satisfaction with barrier; improvement to durisol barrier; and perception of noise barriers in general. Relevant comments from the respondents are included to support the findings. The final chapter presents a discussion of the issues involved in the construction of noise barriers.

BACKGROUND

This survey of the Victoria Park-Don Valley residents is similar to a study completed in April 1979 on the impact of the noise barriers constructed along Highway 401 in the Borough of Etobicoke and along the Queensway in Ottawa.¹ Unlike the present study, the Etobicoke-Ottawa one used experimental and control samples and surveys were conducted in both areas before and after the construction of the barriers.

1 F. Schliewinsky and M. J. Adams. Analysis of Noise Barrier Impact On Dissatisfaction With Freeway Annoyances. Environics Research Group. Conducted for the Ministry of Transportation and Communications, April 1979.

In both Etobicoke and Ottawa, significant decreases in dissatisfaction with several freeway annoyances were found as the result of the construction of the noise barrier. However, almost half of the Etobicoke households were still dissatisfied with the noise levels after the construction of the barrier compared to only one-fifth of the Ottawa households.

The difference in the effectiveness of the noise barrier in these two areas is attributed to the difference in noise levels originating from the freeways. Before the construction of the barriers, the noise level readings were higher in Etobicoke, 75 dB(A) than in Ottawa, 63 dB(A). After the installation of the noise barriers, the noise level readings were 69 dB(A) and 57 dB(A) in Etobicoke and Ottawa respectively. Therefore, despite the average decrease of 6 dB(A) in both areas after construction of the noise barrier, noise levels in Etobicoke remained relatively high. See Table 1 for details.

The Don Valley-Victoria Park area is intermediate in terms of noise level in comparison to the Ottawa-Etobicoke areas. In the former area, the noise level was estimated as 69 dB(A) for first row homes before the construction of the barrier. After the installation of the four metre concrete barrier, tests were undertaken for noise reduction.²

The durisol barrier produced a noise loss of 8 dB(A) for first row homes behind the Highway and 2 dB(A) for second and third row homes. Therefore, the noise level after the installation of the barrier is now 61 dB(A), as shown in Table 1.

Table 1
Noise Levels Before and After Barriers
In Three Locations

	Etobicoke	Noise Levels ^a Don Valley- Victoria Park	Ottawa
Before Barrier	75 dB(A)	69 dB(A)	63 dB(A)
After Barrier	69 dB(A)	61 dB(A)	57 dB(A)

^a Average for first row homes behind the barrier.

L₅₀ -Unadjusted for traffic variation, 4 feet above ground.

2 D.N. May and M.M. Osman. The Performance of Sound Absorptive, Reflective, and T-Profile Noise Barriers in Toronto. Ministry of Transportation and Communications. September 1979.

RESEARCH METHODS

Sample

A listing of addresses of all households in the study area was prepared using aerial photos and on-site visits. The area was divided into three zones on the basis of the distance of the households from the noise barrier. See Figure 1 for details. The first group (Zone I) consisted of all households whose property is adjacent to Highway 401 or approximately less than 90 metres from the noise barrier. The Zone II respondents consisted of those homes facing the Zone I homes or those residences from 90 to 160 metres from the noise barrier. In most cases, these Zone II dwellings had one dwelling unit between them and the Highway. Exceptions occurred at the bend of the streets which are crescent-shaped where a Zone II dwelling may have two or more dwellings between it and the Highway. The third zone consisted of those homes with two or more dwellings between them and the Highway or approximately 160 to 230 metres from the barrier.

The households at the western and eastern extremities of the area, that is, where the 401 intersects with the Don Valley Parkway and Victoria Park Avenue were excluded from the study. This was done to eliminate the confounding effect of the noise from traffic emanating from these two north-south streets. These households were used to pretest the questionnaire.

The study area, previously defined, contained 280 households. All the houses in the sample were semi-detached dwellings except for 13 single family homes located in Zone III. It should be noted that the sampling frame includes all homes in the area. An attempt was made to interview a representative from each of the homes in Zone I plus a sample of persons in Zones II and III large enough to provide the sampling quota of 200 completed interviews. In effect, we attempted to conduct a census of all 280 homes but gave priority in call backs to Zone I.

Questionnaire

The questionnaire was pretested on two occasions with 20 residents whose houses were adjacent to Highway 401. The first pretest was with residents living near the intersection of 401 and Victoria Park Avenue, the second with those near the intersection of 401 and the Don Valley Parkway.

The questionnaire was structured so that the first few questions would not disclose to the respondents that the primary focus of the survey was about the noise barrier. Before answering a series of questions about the barrier, the respondents were asked how satisfied they were with several features of their neighbourhood.

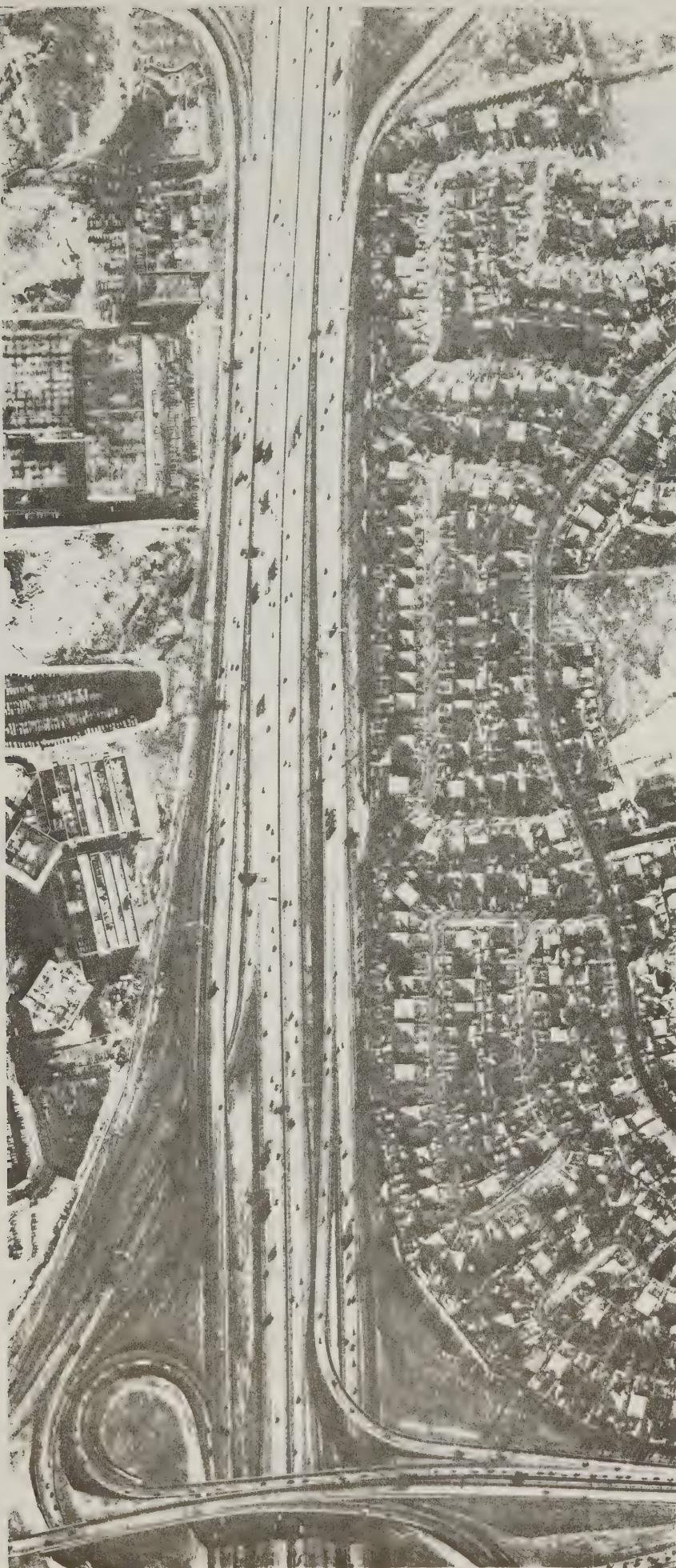


Figure 1 Map of Study Area

The questionnaire also investigated the situation before the barrier was installed by asking the respondents if noise from the Highway had been a problem, what they expected from the barrier, resulting problems, and unanticipated benefits received. These 'before' questions were included since data were not available to describe the situation prior to the installation of the noise barrier. It should be noted that those residents who moved into the area after the installation of the noise barrier were not asked these particular questions.

The residents' perception of the durisol barrier as a physical artifact was determined by asking the respondents to suggest ways the barrier could be improved in terms of colour, landscaping, and design from both a residential and highway view. The respondents' overall level of satisfaction with the barrier and how worthwhile it had been were ascertained.

One objective of the survey was to determine people's perceptions of barriers in general. The respondents were shown three different sets of photographs to determine aesthetic, colour and design preferences. The aesthetic impact of barriers which have been built along the Highway 401 in Toronto was also explored.

For a copy of the questionnaire, see Appendix I.

Data Collection

The survey was conducted from November 23 to December 11, 1979 by four experienced interviewers. A letter was mailed to the 280 households in the study area to inform the occupants that a study of their attitudes to their neighbourhood was going to be conducted by a research firm for the Government of Ontario.

Up to four call backs were made to each household as needed to achieve the total quota of 200 interviews. When making call backs, priority was given to households in Zone I. One resident, 18 years of age or older was interviewed per household. An attempt was made to get an equal proportion of male and female respondents.

Approximately 10% of the interviews were verified by means of a telephone survey to ensure their authenticity and to compare the answers to a small number of questions.

Data Analysis

The questionnaires were edited, coded, keypunched, and verified onto cards. The data were analyzed by zone (proximity to the highway), by sex of the respondent, and by length of residence. Selected questions were analyzed by the age group of the respondent, whether the respondent considered noise a problem before the installation of the durisol barrier and by how satisfied the respondents were with the barrier.

RESEARCH FINDINGS

Sample Characteristics

A total of 207 residents, representing 73.9% of the households in the study area, were interviewed. Three respondents in Zone III who claimed to be unaware of the durisol barrier were not interviewed. On a zone basis, the completion rate was: Zone I, 83.7%; Zone II, 72.3%; and Zone III, 64.2%. Almost two-fifths (39.6%) of the total sample lived in Zone I, 35.3% in Zone II, and 25.1% in Zone III.

Slightly more females (51.7%) than males (48.3%) were interviewed. In Zone I, more males (52.4%) than females (47.6%) were surveyed but in Zones II and III, the opposite occurred. These sex differences by zone were not statistically different.

The respondents were classified into the following age groups: 18-24 years, 13.6%; 25-34 years, 23.3%; 35-44 years, 22.8%; 45-54 years, 30.1%; 55-64 years, 6.3%; and 65 years and older, 3.9%. No statistical differences were found among the six age groups by zone or by sex of the respondent.

The area appears to be very stable in terms of mobility since over half the respondents (55.1%) have lived in their house for 10 or more years and almost one-third (29.0%) moved into their house between 1970 and 1977. Almost one-sixth of the sample or 33 residents purchased their house during 1978 and 1979. Twenty-two residents, (10.6%) of the total sample, who moved into their house after the barrier was installed (after September 1978) are referred to in this report as short-term as opposed to long-term residents. No significant difference was found among the zones by length of residence. However, more short-term (36.4%) than long-term (21.7%) residents are from 25 - 34 years of age. This indicates the more recent arrivals tend to be younger than the long-term residents.

The majority of the respondents own their home rather than rent, 93.2% vs. 6.8% respectively. No statistical difference was found in ownership among zones.

Attitude To Neighbourhood

Dissatisfaction To Specific Features

In order to obtain the respondents' overall assessment of their residential area, they were asked to rate eleven neighbourhood features in terms of their degree of satisfaction. This was done before the residents were asked questions concerning the durisol

barrier. The 8-point scale ranged from complete satisfaction to complete dissatisfaction. For analysis purposes, the scale was collapsed into three groups as follows:

Satisfied- The percentage of respondents who were either completely, very or quite satisfied.

Neither satisfied nor dissatisfied- The percentage of respondents who were either somewhat satisfied or somewhat dissatisfied or did not state an opinion.

Dissatisfied- The percentage of respondents who were either completely, very or quite dissatisfied.

The neighbourhood features investigated are listed in question 4 of the questionnaire in Appendix I and in Table 2. All of these features, except for noise from airplanes, are related to noise or other problems created by Highway 401. As shown in Table 2, two-fifths (41.5%) of the respondents were dissatisfied with the amount of noise from the Highway when using their yard or balcony. It should be noted that 20.3% of the respondents answered "completely dissatisfied".

Table 2
Dissatisfaction With Neighbourhood Features
By Zone¹

Neighbourhood Features	I	Zone		Total
		II	III Percentage	
Highway noise in general	24.4	24.6	25.0	24.7
Highway noise-talking in house	8.6	2.8	1.9	4.8
Highway noise-reading or relaxing in house	3.6	2.7	1.9	2.9
Highway noise-sleeping	34.2	21.9	36.5	30.5
Highway noise-outside	45.1	35.7	44.2	41.5
Visual privacy from traffic	8.5	1.4	1.9	4.4*
Vibrations on windows/dishes	20.7	2.8	1.9	9.7*
Fumes from highway traffic	29.3	9.6	15.4	18.9*
Salt spray from highway traffic	24.4	16.5	15.3	19.3*
Dust & dirt on yard/balcony	37.8	21.9	25.0	29.0*
Noise from airplanes	1.2	6.9	9.6	5.3
Number of Respondents	82	73	52	207

¹ Respondents who are completely, very or quite dissatisfied.

* Significant differences by zone, $p < .05$. All significant differences reported were tested by means of chi squares using the .05 level.

Approximately the same percentage were dissatisfied with the amount of noise when they are sleeping (30.5%) as with the amount of dust and dirt that settles on their yard or balcony (29.0%). However, 14.5% were "completely dissatisfied" with the former feature compared to 9.7% with the latter one.

Almost one-quarter (24.7%) of the residents were dissatisfied with the amount of noise from the Highway but only a few felt the highway noise interferred when they were indoors talking, reading or relaxing. More respondents were concerned about the non-noise problems such as fumes and salt spray or residue. Almost one-fifth were dissatisfied with the amount of fumes (18.9%) and salt spray (19.3%).

One-tenth (9.7%) of the respondents were dissatisfied with the amount of vibrations on their windows or dishes caused by traffic on Highway 401. The amount of visual privacy the residents have from traffic on the Highway does not appear to be a concern among the residents as only 4.4% were dissatisfied. Approximately the same percentage (5.3%) were dissatisfied with noise from airplanes.

The percentage of respondents dissatisfied by zone is also shown in Table 2. While the five features related to noise were not significantly different by zone, the non-noise highway problems were. A greater percentage of Zone I than II or III respondents were dissatisfied with the amount of dust and dirt, fumes, salt spray, vibrations, and visual privacy from the Highway. Zone II and III households are probably far enough from the Highway that dust, dirt, fumes, salt spray and vibrations do not create problems for them.

The percentages cited above indicate the residents who were dissatisfied with their neighbourhood features. Table 1, Appendix II presents the percentages of respondents for each zone who were satisfied, neither satisfied nor dissatisfied and dissatisfied. For all the highway-related features, except visual privacy, from one-quarter to one-third of the respondents were neither satisfied nor dissatisfied. Six out of seven respondents were satisfied with the amount of visual privacy from traffic on the Highway.

The residents' dissatisfaction with features of their neighbourhood was analyzed by the sex of the respondent and length of residence. No significant differences were found by sex, but a significantly higher percentage of long-term (32.4%) than short-term (13.6%) were dissatisfied with the amount of noise when sleeping.

Moving From Neighbourhood

Another indication of the residents' attitude to their neighbourhood was whether or not they had considered moving from the area. As previously stated, the neighbourhood appears to be stable with over half of the residents living in their house since before 1970. However, almost one-third (31.9%) of all the respondents had thought about moving from the area. The reasons given by these 66 respondents were as follows: inadequate house size or style, 34.9%; personal or job-related, 22.7%; noise from the highway, 22.7%; and location not suitable, 19.7%. Twelve of the fifteen respondents who thought about moving because of noise from the Highway lived in Zone I and the remainder, in Zone II.

When the respondents who mentioned the Highway as a reason for moving were asked why they had not moved, three respondents in Zone I (1.5% of the total sample) mentioned the barrier had reduced the noise level. One respondent who moved into her house in 1967 stated: "They built a wall now so it's much better. We also wanted to finish paying the house first, then, we heard the wall was going up".

Perception of Noise Before Barrier

The residents were asked a series of questions to determine their perception of the noise from the Highway before the barrier was erected and their expectations as to the effect of the barrier. The twenty-two respondents (10.6% of the total sample) who moved into their house after the barrier was installed were not asked these questions. The percentages are therefore based on 185 long-term respondents.

Expectations

As shown in Table 3, over two-thirds (68.7%) of the long-term respondents expected the barrier would reduce noise to a certain extent, eliminate it completely or make a substantial difference. Other positive expectations were: reducing the amount of dust and dirt both inside and outside the house, 5.4%; improving the amount of privacy from seeing the traffic on the Highway or from the travellers on the Highway seeking assistance, 3.8%; and reducing other highway-related non-noise problems such as fumes, salt spray, and snow drifting, 3.8%.

Only 2.2% of the long-term respondents expected negative results such as a jail-like appearance, an increase in noise level, and vandalism. It is interesting to note that over one-quarter (28.7%) of the long-term respondents had never considered potential effects or believed the barrier would not benefit them.

Table 3
Expectations From Durisol Barrier

Expectations	Long-term Resp. %
Reduce noise level	53.0
Eliminate noise completely	15.7
Reduce amount of dust and dirt	5.4
Improve visual privacy	3.8
Other positive results i.e. reduce fumes, increase property value	3.8
Negative expectations	2.2
No expectations/will not benefit	28.7
	<u>112.6</u> ^a

Number of Respondents 185

a Percentage exceeds 100% because up to 2 responses were allowed.

Consider Noise A Problem

Just under two-thirds (62.7%) of the long-term residents considered noise a problem before the barrier was installed. The difference by zone was statistically different. The percentages were as follows: Zone I, 75.3%; Zone II, 51.6%; and Zone III, 58.3%. These percentages are based on 73, 64, and 48 residents in each zone respectively.

The 116 residents who considered noise a problem described how the noise bothered them. The types of problems caused by the Highway are listed in Table 4. It appears that noise from the Highway bothered the residents both outside and inside their homes. Just over three-quarters (77.2%) of these respondents mentioned the noise outside as a problem and 72.8% mentioned the noise affected them while inside. Although not statistically different, more Zone I respondents complained about the noise limiting use of their backyards and more Zone II and III residents complained about the noise level inside the house. It should be noted that some respondents made particular mention of the noise being worse in the summer during rush hour on certain evenings and when trucks shift their gears.

Table 4
Types of Problems Caused By Noise

Types of Problem	%
Very noisy outside	47.4
Noise outside limited use of backyard	29.8
Noise affected sleeping	43.0
Noisy inside house	29.8
Physical discomforts	6.1
Other non-noise highway problems	7.9
	<hr/>
	164.0 ^a
Number of Respondents	114 ^b

^a Percentage exceeds 100% because up to 2 responses were allowed.

^b Two respondents did not describe the type of problems.

Almost one-third (29.8%) of the respondents who considered noise a problem made a comment suggesting they could not use their front or backyards because the noise was unbearable or a normal conversation could not be conducted. As one Zone II respondent stated: "Summer weekends we stayed in rather than out. We built our life-style around the noise from the highway". Two-fifths (43.0%) of the respondents complained that the Highway noise disturbed their sleeping. One Zone I respondent stated: "I had to be exhausted to fall asleep in the summertime". Those respondents with bedrooms facing the Highway specifically mentioned this problem. The respondents who found it generally noisy in their houses stated they had to keep their windows closed or else they would be unable to read, watch television or hear the phone ring.

A small percentage (6.1%) claimed physical discomfort from the noise such as dizziness, headaches, wearing on nerves, etc. Although the question referred to the effects of noise, 7.9% of the respondents mentioned non-noise highway problems such as film on windows, vibrations, and no privacy.

When asked if the noise barrier eliminated the above types of problems, three-quarters (76.6%) of the respondents who considered noise a problem felt the situation had been improved somewhat, 21.7% still had the problems, and 1.7% no longer had the problem.

Overall Perception of Durisol Barrier

Two questions were used to measure the residents' overall attitude to the durisol barrier, namely, how satisfied they were with it, and how worthwhile they considered it to be.

Satisfaction With Barrier

Just over half (53.1%) of the respondents were quite, very or completely satisfied with the barrier, 37.7% were neither satisfied nor dissatisfied or had no opinion and 9.2% were quite, very or completely dissatisfied with the barrier. The percentages for the two extreme positions on the attitude scale, completely satisfied and completely dissatisfied were 9.7% and 5.3% respectively. The residents' level of dissatisfaction with the barrier did not vary significantly by zone, sex or age of the respondent.

How Worthwhile

The second measure of the respondents' overall assessment of the barrier identified how worthwhile the barrier had been. The percentage of respondents who believed the barrier had been very worthwhile, somewhat worthwhile and not worthwhile were: 34.3%, 45.9%, and 14.5%. As shown in Table 5, more Zone I than II or III respondents considered the barrier "very worthwhile".

Approximately the same percentage of respondents in all three zones considered the barrier somewhat worthwhile. The residents may have considered both personal and community or neighbourhood benefits in responding to this question.

Table 5
Percentage of Residents Who Consider The
Barrier Worthwhile By Zone

	Zone ^a			Total
	I	II	III	
Very worthwhile	42.7	30.1	26.9	34.3
Somewhat worthwhile	47.6	46.6	42.4	45.9
Not worthwhile	7.3	19.2	19.2	14.5
No opinion	2.4	4.1	11.5	5.3
Total	100.0	100.0	100.0	100.0
Number of Respondents	82	73	52	207

a Significant differences by zone, $p < .05$

As might be expected, a significantly higher percentage of respondents who were satisfied with the noise barrier as compared to those dissatisfied also considered it as "very worthwhile". The percentages of residents who were satisfied, neither satisfied nor dissatisfied, and dissatisfied with the barrier who believed the barrier was "very worthwhile" were: 54.5%; 14.1%; and none respectively. The finding that more short-term (59.1%) than long-term residents (31.4%) considered the barrier "very worthwhile" is difficult to interpret.

Perception of Situation After Barrier Installed

Several questions investigated the situation after the barrier was installed.

Expectations

As stated in a previous section, 68.7% of the long-term respondents expected the barrier to reduce or eliminate noise. Almost two-fifths (38.9%) of the long-term respondents stated that a noise reduction occurred. The noise was either eliminated or reduced to such an extent that it was considered to be an improvement. One-quarter (24.3%) of the long-term residents reported their expectations were not met because the noise level was not reduced or it was not reduced as much as they anticipated.

Unanticipated Benefits

The respondents were asked if they received any unexpected benefits from the noise barrier. As shown in Table 6, two-thirds (67.4%) of the long-term residents did not receive any unanticipated benefits. One-third of the respondents reported unanticipated benefits. The barrier has provided more privacy to the residents, especially those in Zone I. The wall has physically blocked out the view of the traffic, the glare of the lights, and prevented distressed travellers from disturbing the residents. As one resident stated: "We can stay in our backyard without everyone looking at us".

It is interesting to note that 7.1% of the long-term residents mentioned noise as an unanticipated benefit. These respondents apparently did not expect any noise reduction before the barrier was installed. One respondent stated: "I relax more now. It has cut down noise for us".

Most of the other benefits such as less dust and dirt, reduced salt spray and wind etc. were mentioned by the Zone I respondents. A few respondents stated their windows did not need cleaning as often and the trees are growing due to less salt. The reduced amount of wind has prevented garbage from blowing in their yards, and changed the drift pattern of the snow. Only a few (2.8%) of the Zone I respondents mentioned they enjoy seeing the squirrels and birds which increased in numbers after the barrier was installed.

Some other benefits mentioned by just under 10% of the Zone I respondents were: an increase in property value, elimination of raccoons, an increased feeling of safety for their children while playing in their backyard and from cars running off the highway. One respondent commented: "I feel safer if there's an accident. The wall may stop the impact".

Table 6
Unanticipated Benefits Received From
The Barrier By Zone

Unanticipated Benefits	Zone ^b			Total
	I	II Percentage	III	
No unanticipated benefits	40.3	82.8	87.4	67.4
Visual privacy	27.8	10.9	2.1	15.2
Reduce noise from highway	12.5	1.6	6.3	7.1
Less dust and dirt	6.9	3.1	4.2	4.9
Reduce salt spray	6.9	-	-	2.7
Reduce wind	8.3	-	-	3.3
More squirrels and birds	2.8	-	-	1.1
Reduce fumes	1.4	-	-	0.5
Other benefits	9.7	1.6	-	4.4
Total	116.6 ^a	100.0	100.0	106.6 ^a
Number of Respondents	72	64	48	184

a Percentage for Zone I and total sample exceeds 100% because 12 Zone I residents gave a second response to this question.

b Significant differences by zone, $p < .05$

Problems Caused By Barrier

The barrier appears to have caused problems for some of the residents. The percentage of respondents who stated the barrier caused a problem were by zone: 42.5%; 7.8%; and 6.3%, respectively. One-fifth (21.1%) of the long-term residents mentioned a problem. The types of problems are listed in Table 7. The percentages should be treated with caution as the numbers are quite small.

The two major problem areas involve the occurrence of anti-social behaviour and the lack of property maintenance. According to the residents in Zone I, young people play and do mischievous things on the government land on the residential side of the barrier. This respondents stated the wall provides too much privacy since the offenders cannot be seen from the highway. Some cases of malicious damage were reported. Comments exemplifying this type of problem include:

"Vandalism. I have heard that boys climb over the wall into the backyards".

"Vandalism. Broke my child's swing set".

"Too much privacy. For example, people feel more comfortable climbing back fences and coming into yard. No one to see them. Kids use space between fence and barrier to smoke pot".

"Things in my yard were damaged. It has a 3 feet gap at bottom and my dog got out and chewed up another dog and cost me \$200".

Table 7

Types of Problems Caused By Noise Barrier
By Zone

Type of Problems	I	Zone		Total
		II Percentage	III	
Anti-Social behaviour	35.5	-	-	28.2
Lack of maintenance	32.3	-	-	25.6
Negative feeling	19.4	20.0	33.4	20.5
Property problems	22.6	-	-	18.0
Increase noise level	3.2	80.0	33.3	15.4
Miscellaneous problems	6.5	-	33.3	7.7
Total	119.5 ^a	100.0	100.0	115.4 ^a
Number of Respondents	31	5	3	39

^a The percentage for Zone I and the total sample exceeds 100% because Zone I respondents gave a second response.

According to some adjacent property owners, the strip of government land is not properly maintained. The residents complained of garbage, weeds, and uncut grass. Statements such as "it's dirty between the fence and the barrier" and "don't cut grass-full of weeds which blow into our yard" were made. At the end of the questionnaire, additional comments were made about the lack of maintenance. The following are quotations from Zone I respondents.

"Would like Department of Road to tend to the barrier on the house side and don't just forget it because it's hidden from the 401".

"Please see if anything can be done to get better maintenance of strip from sound barrier to your property line".

"The big problem is the area between the fence and barrier. It is not taken care of".

" Could improve care of weeds and such. Don't cut till very high".

One-fifth (22.6%) of the Zone I respondents complained the installation of the barrier caused such problems as: an increase in the number of squirrels, drainage runoff, and problems during the construction of the barrier. As one resident who has lived in her house since 1962 said: "Wild animals have burrowed into our yard this year which we never had before. Also squirrels are nesting". Another resident of 18 years stated: "It could have been sloped better for drainage- runoff goes into the backyard". One female resident was not very happy "when they dug a hole and filling it in, they took dirt from our garden!".

One-fifth (19.4%) of the Zone I respondents also stated they did not like the wall itself or preferred to see the traffic rather than the wall. Terms such as jail-like, like a concentration camp were used to describe the wall and the feeling of confinement it creates.

Six respondents believed the noise level has increased since the installation of the barrier due to a rebounding effect. One male Zone I respondent who has lived in the area since 1967 felt the noise barrier "has caused westbound traffic sound to rebound into backyard". The following are comments of Zone II respondents.

"It's noisier now then ever. It ricochets more to us then ever before".

"Has had tunnelling effect of noise on upstairs bedrooms and they are now more noisy".

"Worse with the barrier, noise goes up and comes over now".

Features Improved By Barrier

The long-term respondents were asked to compare the situation now with the situation before the barrier was installed in terms of a feature being much or slightly better, unchanged, or much or slightly worse. For purposes of analysis, the percentages of respondents who answered better, unchanged, and worse are presented in Table 8.

Table 8
Changes Barrier Made By Zone

Situation	I	Zone II Percentage	III	Total ^a
Overall Situation				
Better	86.3	50.0	39.6	61.6 *
No difference	12.3	42.2	58.3	34.6
Worse	1.4	4.7	2.1	2.7
Traffic Noise From 401				
Better	90.4	56.2	41.7	66.0 *
No difference	8.2	35.9	47.9	28.1
Worse	1.4	6.2	8.4	4.9
Noise In Some Sections of House				
Better	67.1	40.6	33.4	49.2 *
No difference	30.1	51.6	62.5	45.9
Worse	2.7	4.7	4.2	3.7
Visual Privacy In Yard From 401				
Better	84.9	26.6	12.5	45.9 *
No difference	5.5	70.3	85.4	48.6
Worse	6.9	-	-	2.7
Dust and Dirt Settling On Yard				
Better	65.8	28.1	25.0	42.2 *
No difference	32.9	67.2	68.8	54.1
Worse	-	3.1	-	1.1
Fumes From Traffic On 401				
Better	43.8	18.8	14.6	27.5 *
No difference	46.6	71.9	77.1	63.2
Worse	1.4	1.6	-	1.0
Vibrations On windows/dishes From Traffic On 401				
Better	38.4	18.7	16.7	26.0
No difference	53.4	76.6	75.0	67.0
Worse	4.1	1.6	-	2.2
Salt Spray From the 401				
Better	38.4	12.5	14.6	23.3 *
No difference	34.2	67.2	68.8	54.6
Worse	1.4	1.6	-	1.1
Use Back or Front Yard				
More	30.1	6.3	6.4	15.8 *
Same	65.8	92.2	93.6	82.1
Less	4.1	1.6	-	2.2
No. of respondents	73	64	48	185

* Significant differences between zones, p < .05

^a Percentage answering "can't say" are not reported".

In general, over three-fifths (61.6%) of the long-term respondents felt the overall situation was better now, one-third (34.6%) saw no difference, and 2.7% believed the overall situation was worse. The specific features investigated and the percentage of respondents who believed the situation was better were: traffic noise from the Highway, 66.0%; amount of noise in some sections of the residence, 49.2%; visual privacy from the Highway, 45.9%; amount of dust and dirt settling on yard, 42.2%; amount of fumes emanating from the Highway traffic, 27.5%; amount of vibrations on windows and/or dishes from Highway traffic, 26.0%; and the amount of salt spray from Highway, 23.3%.

For all these problems, except vibrations, a significantly higher percentage of Zone I respondents than Zone II and III believed the problem less severe now than before the barrier was constructed. For example, the percentage of respondents by zone who believed the amount of noise from Highway 401 was less were: Zone I, 90.4%, Zone II, 56.2%, and Zone III, 41.7%. Eight of the nine respondents who claimed noise was worse lived in Zones II and III.

Generally the percentage of respondents who could not draw a comparison was under 10%. However, one-fifth of the respondents could not comment on the salt spray issue. A few respondents claimed their section of the noise barrier was not completed until Spring 1979 so they have not experienced a winter during which the barrier has been completely installed. However, the barrier was completed in November 1978.

As stated earlier, a substantial percentage of respondents complained about the traffic noise interfering with the use of their front or back yards. Twenty-nine respondents, representing 15.8% of the long-term residents, believe they have spent more time outside since the barrier has been installed. As shown in Table 8, this trend is particularly evident for Zone I respondents.

The most frequent reason given for greater use of yards involved Highway noise reduction. Comments included:

"Before it (backyard) was useless, if you were in the yard, you'd go crazy. Now it's quieter".

"Less noisy, more private, yard is cleaner".

"Able to barbecue more because less dirt and more privacy. Now considering putting in a pool".

Only two Zone I respondents use their yard less as a direct result of the barrier, one because the respondent "can't stand looking at the wall" and the other because it "looks awful now with the dirt and weeds between the fence".

The issue of how the situation changed since the barrier was constructed was explored by probing for any other changes. Positive comments include:

- "Lights at night in the bedroom are gone".
- "Used to be a terrible wind and is completely stopped now".
- "We are for it, a good thing, even for the sale of the house".

Negative remarks included:

- "Haven't noticed any difference. Looks like Berlin Wall".
- "Great expense to tax payers with no benefits".
- "Can't leave windows on back of house open".
- "All depends on wind factor whether we get more noise or not".
- "Don't cut grass and weeds. Very large patch not tended. Don't water sod".
- "Sod will slide down hill or be dead in the Spring".
- "The steady hum is as bad as noise". (Apparently after the barrier was installed the noise changed to a hum).

Level of Satisfaction With Barrier

Overall Satisfaction

As described in an earlier section of this report, just over half (53.1%) of the respondents were quite, very or completely satisfied with the barrier, 37.7% were neither satisfied nor dissatisfied or did not state an opinion, and 9.2% were quite, very or completely dissatisfied with the barrier.

Additional analysis of the responses found that respondents in Zone I who stated noise was a problem before the barrier was installed were more satisfied with the barrier than those who did not feel noise was a problem. The opposite finding occurred among Zone II respondents. The residents in Zone II who did not consider noise a problem before the barrier was installed were more satisfied. No significant difference existed among Zone III respondents for this analysis. See Table 9 for details.

Table 9
Perception of Noise Before Barrier
By Attitude To Barrier By Zone

Attitude To Barrier	Perception of Noise Before					
	Zone I ^a		Zone II ^b		Zone III	
	Noise Problem	Not Problem	Noise Problem	Not Problem	Noise Problem	Not Problem
Satisfied	58.2	38.9	45.5	71.0	42.9	50.0
Neither satisfied nor dissatisfied	38.2	33.3	45.4	22.5	42.8	45.0
Dissatisfied	<u>3.6</u>	<u>27.8</u>	<u>9.1</u>	<u>6.5</u>	<u>14.3</u>	<u>5.0</u>
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of Respondents	55	18	33	31	28	20

a Significant at .021

b Significant at .013

Reasons Given

The reasons given for the expressed level of satisfaction are shown in Table 10. Since up to two comments could be given, the percentages are based on the number of respondents rather than responses and thus exceed 100%.

Approximately half (51.2%) of the respondents said that the barrier has reduced the noise level. Some residents find it more relaxing, can sleep better or use their yard more often. As might be expected, only those residents who were either satisfied or neither satisfied nor dissatisfied with the barrier gave this reason.

However, over one-quarter (27.3%) of the respondents felt the noise level was not reduced enough or they had not seen any improvement at all or in fact, felt the noise level had increased. Only three people who stated they were satisfied with the barrier felt it had not reduced noise enough.

Table 10
Reason For Level of Satisfaction
With Noise Barrier

Reasons	%
Reduced noise	51.2
Noise level not reduced enough	14.5
Noise level not reduced at all	11.1
Noise level increased	1.7
Improved visual privacy	8.2
Improved dust, salt, fumes, etc.	13.5
Did not improve non-noise problems of dust, salt, fumes, etc.	3.4
Dislike appearance of barrier	5.8
Created problems: anti-social behaviour and lack of property maintenance	.2.4
Don't know	<u>12.6</u> ^a
Total	124.8 ^b
Number of Respondents	207

^a The percentage exceeds 100% because up to two reasons could be cited.
^b Twenty-six respondents did not state a reason or express how satisfied they were with the barrier.

Apart from noise reduction, one-fifth (21.7%) of the respondents felt the barrier had reduced problems such as a lack of privacy from traffic, dust and dirt, fumes, and salt spray. No one who was dissatisfied with the barrier mentioned any improvements in non-noise problems. About one-tenth (11.6%) of the respondents were dissatisfied with the barrier because of: the existence of non-noise highway problems; the unattractive appearance of the barrier itself; the lack of maintenance of the property surrounding the barrier; and an increase in anti-social behaviour occurring on the residential side of the barrier.

Negative remarks included:

"They've wasted their money. The noise level has been reduced so little. Why didn't they put it closer to the 401".

"They said it would improve sound and it hasn't done it at all and it's very unappealing to the eye".

"It's ugly and not maintained".

"Makes you nervous to go into backyard at night - has promoted vandalism".

"Appearance O.K. We still get noise, a very poor job. Just put it up for sake of putting something up. No thought to it".

There was no significant difference found between zones regarding the level of satisfaction with the barrier, but the reasons given varied by zone. More respondents in Zone I felt the barrier improved visual privacy and had reduced other non-noise problems and more respondents in Zones II and III felt the barrier was not effective in reducing noise.

Attitude To Neighbourhood By Satisfaction With Barrier

The residents' satisfaction to specific neighbourhood features was analyzed by dissatisfaction with the durisol barrier. The eleven features, previously described in this report, were: the highway noise in general; noise when talking; noise when reading and relaxing; noise while sleeping; noise outside; the amount of privacy; vibrations; fumes; salt spray; dust and dirt from the highway; and amount of noise from airplanes.

Dissatisfaction with the durisol barrier was found to be directly related to dissatisfaction to four out of the eleven neighbourhood features. These were: amount of highway noise in general, noise when sleeping and using the yard and the amount of dust and dirt that settles in yard from the highway.

As shown in Table 11, approximately 53% of the nineteen respondents, who were dissatisfied with the barrier were also dissatisfied with noise in general and when sleeping. In contrast, one-fifth (21.1%) of the respondents who were dissatisfied with the barrier were satisfied with the highway noise in general and noise when sleeping.

Over two-thirds (68.4%) were dissatisfied with noise when outside. The direct relationship does not exist for the non-noise problems, except for dust and dirt. Almost 60% of the respondents who were dissatisfied with the barrier were dissatisfied with the amount of dust and dirt that settle in their yards. This compares to one-tenth (10.5%) who were dissatisfied with the barrier but satisfied with the amount of dust and dirt.

Table 11

Level of Satisfaction With Neighbourhood
Features By Level of Satisfaction With
Durisol Barrier

Attitude To Neighbourhood	Attitude To Barrier		
	Satisfied	Neither Satisfied/Dissatisfied	Dissatisfied
	Percentage		
Highway noise in general			
Satisfied	47.2	25.6	21.2 *
Neither satisfied/dissatisfied	36.4	44.9	26.2
Dissatisfied	<u>16.4</u>	<u>29.5</u>	<u>52.6</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Highway noise-talking in house			
Satisfied	79.2	62.8	47.3 *
Neither satisfied/dissatisfied	19.0	33.3	26.4
Dissatisfied	<u>1.8</u>	<u>3.9</u>	<u>26.3</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Highway noise-reading/relaxing			
Satisfied	78.2	57.7	47.4 *
Neither satisfied/dissatisfied	20.9	41.0	31.6
Dissatisfied	<u>0.9</u>	<u>1.3</u>	<u>21.0</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Highway noise-sleeping			
Satisfied	44.5	39.7	21.0 *
Neither satisfied/dissatisfied	33.6	23.1	26.3
Dissatisfied	<u>21.9</u>	<u>37.2</u>	<u>52.7</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Highway noise-outside			
Satisfied	35.5	14.1	10.5
Neither satisfied/dissatisfied	32.7	37.2	21.1
Dissatisfied	<u>31.9</u>	<u>48.7</u>	<u>68.4</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19

Table 11 Continued

Attitude To Neighbourhood	Attitude To Barrier		
	Satisfied	Neither Satisfied/Dissatisfied	Dissatisfied Percentage
Visual privacy from traffic			
Satisfied	88.2	89.7	57.8
Neither satisfied/dissatisfied	7.3	7.7	31.6
Dissatisfied	<u>4.5</u>	<u>2.6</u>	<u>10.6</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Vibrations on windows/dishes			
Satisfied	65.4	62.8	47.4
Neither satisfied/dissatisfied	26.4	29.5	26.3
Dissatisfied	<u>8.2</u>	<u>7.7</u>	<u>26.3</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Fumes from highway traffic			
Satisfied	55.5	42.3	36.8
Neither satisfied/dissatisfied	29.1	37.2	31.6
Dissatisfied	<u>15.4</u>	<u>20.5</u>	<u>31.6</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Salt spray from highway traffic			
Satisfied	51.0	42.3	36.8
Neither satisfied/dissatisfied	30.0	38.5	42.1
Dissatisfied	<u>19.0</u>	<u>19.2</u>	<u>21.1</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Dust and dirt on yard/balcony			
Satisfied	48.0	26.9	10.5 *
Neither satisfied/dissatisfied	29.1	39.8	31.6
Dissatisfied	<u>20.9</u>	<u>33.3</u>	<u>57.9</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19
Noise from airplanes			
Satisfied	78.2	69.2	73.6
Neither satisfied/dissatisfied	18.2	23.1	21.1
Dissatisfied	<u>3.6</u>	<u>7.7</u>	<u>5.3</u>
Total	100.0	100.0	100.0
Number of Respondents	110	78	19

* Significant differences by zone, $p < .05$

Improvement To Durisol Barrier

The respondents were asked to provide suggestions as to how the durisol barrier could be improved from both the residential and highway sides. The question format was different for these two questions. The question used to determine reactions to the residential side of the barrier was closed-ended. The respondents were asked if they would: change the colour; the height; the thickness; the design; or do some landscaping. The question format for the highway view was open-ended. See questions 16 and 19 in the questionnaire, Appendix I. It should be noted that prior to these questions, the respondents had seen photographs of various colours and designs for noise barriers.

Residential View

The percentage of respondents by zone indicating a change is needed to improve the barrier on the residential side is shown in Table 12. The percentages by zone are significantly different but the differences may be due to the higher percentage of "don't know" answers from Zone II and III respondents.

Table 12
Suggestions For Improving Barrier From Residential View By Zone

Suggestion	Zone			Total
	I	II	III	
% indicating change needed				
Landscaping	74.4	60.3	50.0	63.3 *
Colour	50.0	27.4	17.3	33.8 *
Higher	28.0	23.3	23.1	25.1 *
Thicker	28.0	15.1	13.5	19.8 *
Design	23.2	16.4	5.8	16.4 *
No. of respondents	82	73	52	207

* Significant differences by zone, $p < .05$

Almost two-thirds (63.3%) of the respondents suggested the government landscape the area; one-quarter (24.6%) did not want landscaping; and one-eighth (12.1%) did not know. It is not surprising that more Zone I respondents (74.4%) than Zone II and III (60.3% and 50.0% respectively) suggested landscaping. The suggestions favoured the planting of trees or a combination of trees and small shrubs or bushes.

A few (eleven) respondents mentioned ivy or vines and four people thought a hedge would be an improvement. The reasons for landscaping, provided by a few respondents, included: "Landscaping would remove the bare look"; "Trees may absorb the noise"; and "Shrubs may stop boys walking there if they can't get by the shrubs". Some people stressed the fact they wanted landscaping only if it was properly maintained.

One-third (33.8%) of the respondents believed the colour of the barrier should be changed, one-half (51.2%) felt it should remain unchanged, and 15% did not reply. Sixty-seven out of the seventy respondents, who want a change, indicated their colour preference which is shown in Table 13.

Table 13
Colour Suggested For Durisol
Barrier

Colour Preference	#	% of those stating preference	% of Total Sample
Green	30	44.8	14.5
Brown	17	25.4	8.2
Turquoise	6	8.9	2.9
Blue	5	7.5	2.4
Other	9	13.4	4.3
Total	67	100.0	32.3
Number of Respondents		67	207

The percentages in Table 13 should be interpreted with caution due to the small number of respondents. It is evident that green is the preferred colour, followed by brown. Turquoise and blue were chosen by approximately the same percentage. Other suggestions include: light grey, a brighter, softer, or natural colour, or a wood facing.

Three-fifths (60.9%) of the respondents thought the barrier should remain at four metres, one-quarter (25.1%) suggested building it higher, 1.4% or 3 people thought it should be lower and one-eighth (12.6%) did not make a suggestion regarding the height.

The majority of the respondents (79.3%) did not want to change the width of the barrier or did not make a suggestion. If changed, one-fifth (19.8%) suggested making it thicker and 1.0% or 2 people, thinner.

Similarly, the majority (83.5%) did not want to change the design of the barrier or did not reply. See Table 12. The design change suggested by 16.4% of the respondents included fan shape, T-wall, and comments such as: "Since it's not effective there must be something wrong with the design"; "Build it out of granite or craggy rocks"; "Top of barrier should curve towards highway"; and "Strengthen it as a possible crash barrier".

A few respondents commented on the construction of the barrier at the end of the interview when asked for further comments. These included:

"Put in glass block so still can see the traffic.
Earth could be good sound barrier".

"Make deflector at top or enclose 401 completely".

"Earth mounds with landscaping over it would do the same job as built barriers. They would be cheaper (use land fill) and look better".

Highway View

The percentage of respondents who made a suggestion for improving the barrier from the highway side is shown in Table 14. Just over one-tenth (11.6%) of the respondents who claimed not to have seen the barrier while driving on the Highway did not provide a suggestion for improvement. A significantly higher percentage of males (94.0%) than females (83.2%) have seen the barrier from the Highway.

Table 14
Suggestions For Improving Barrier From The
Highway View

Suggestion	# responses	% of respondents
Landscaping	94	50.8
Colour	48	26.0
Design	12	6.5
No landscaping	6	3.2
Height	5	2.7
No changes-positive features	25	13.5
No suggestions	35	18.9
Other	1	0.5
Total	226	122.1 ^a
Number of Respondents		185 ^b

^a Percentage exceeds 100% because up to three responses could be given.

^b Respondents who have not seen the barrier from the highway did not answer this question.

One-half (50.8%) of the respondents suggested landscaping on the highway side. The comments were similar to those made regarding landscaping on the residential side. One person stated landscaping would be desirable "if it looked more natural-there's no warmth to it- it's so cold". Note that six responses opposed landscaping since the trees would not survive the salt spray from the highway traffic.

One-quarter (26.0%) of the respondents suggested a colour change. They either stated a colour preference or made comments such as: "looks drab"; "too blah looking"; "looks awful when wet"; "colour brighter or lighter for safety at night time"; and "paint scenes or designs on it". Nine people suggested a green colour, two, a brown, and 1 person, turquoise.

Suggestions concerning the design were made by 6.5% of the respondents. One of the five comments suggesting wood panelling was:

"Construct of wood on both sides and concrete in the middle. It would leave an air gap in between and automatically build up a sound barrier. Wood would be more decorative".

One respondent suggested planting trees in the V-section of a fan shaped barrier. Only 2.7% of the respondents suggested a change in the height of the barrier. All five of these responses were for a higher wall.

One-third (32.4%) of the respondents did not make any suggestions. This third is comprised of 18.9% who did not have any suggestions and 13.5% who thought the barrier did not need any improvement. Comments of the latter type included: "Leave it-looks very attractive and neat" and "One of the better barriers put up-leave it".

Issue of Height Increase

The Victoria Park- Don Valley barrier is four metres high. Since it is feasible to build noise barriers up to five metres high, the issue of height preference was further investigated. As stated in the section on the view from the residential side, three-fifths of the respondents thought the barrier should remain at four metres, one-quarter suggested building it higher, 1.4% thought it should be lower, and one-eighth did not make a suggestion. In order to explore the issue further, the respondents were asked whether they would approve or disapprove if the durisol barrier were built another metre higher.

Over half (53.1%) of the respondents would approve of building the barrier one metre higher. Approximately one-quarter (23.7%) would disapprove and 23.2% do not know how they would react if the barrier were built one metre higher. The differences by zone were not statistically significantly different.

The percentage of respondents who would approve, disapprove or neither approve nor disapprove if the durisol barrier were built one metre higher was analyzed by the respondents' level of satisfaction with this barrier. A significant statistical difference was found between the respondents who were satisfied and those who were dissatisfied with the barrier. A higher percentage (54.5%) of the satisfied respondents than dissatisfied (42.1%) would approve of the height increase.

The reasons given for either approving or disapproving of a one metre height increase are listed in Table 15. The 23.2% of the respondents who neither approved nor disapproved did not provide a reason.

Table 15

Reasons For Approving or Disapproving of a
Five Metre Barrier

Reasons	% of those who approve & disapprove
APPROVE OF HEIGHT INCREASE	
Related to noise reduction	52.8
Reduce non-noise highway problems	10.6
Ambivalent reasons	4.3
DISAPPROVE OF HEIGHT INCREASE	
Related to appearance	13.7
No beneficial effects	8.7
Too costly	4.3
Other reasons	5.6
Total	100.0
Number of Respondents	161

Just over half (52.8%) of the respondents who provided a reason would approve because they felt an extra metre would cut down further on the Highway noise. Some of these people qualified their approval only if the height increase made the wall more effective in reducing noise. Comments included:

"Noise would go over the house rather than hit at the upper windows".

'Might eliminate transport truck noise and exhaust".

"I feel to cut down on noise, you should not see the highway. We can see the highway".

One-tenth (10.6%) of the respondents, who stated an opinion, would approve because they believed the extra metre would reduce non-noise highway-related problems. Comments included:

"It will stop the wind in the winter".

"It would cut light from highway".

"Probably reduce amount of spray".

"Perhaps it would keep out more dirt".

A few respondents (4.3%) would approve because "it can't do any harm" and "height makes no difference". These are examples of some of the ambivalent reasons given.

Almost one-seventh (13.7%) of the respondents who stated an opinion would disapprove if one metre were added to the durisol barrier because they believed it would be detrimental to the appearance of the barrier and the surrounding area. Remarks of this nature included:

"Would look even more like prison".

"Would look and feel like a jail".

"Unsightly-too much wall".

"The look of confinement".

Just under one-tenth (8.7%) of these respondents would disapprove because they did not foresee any beneficial effects from a five metre barrier as opposed to a four metre one or thought it was satisfactory as is. Comments included: "Don't think an extra three feet will make a difference" and "It's fine as is".

A few respondents (4.3%) would disapprove of the height increase because of monetary reasons. Statements such as "Going to cost me money and they've wasted enough of my money without putting more concrete on my wall" and "Unnecessary expense" were made.

Other reasons for disapproving involved concerns such as the backyard being too dark at night, would not get the sun and would lack sufficient air. One respondent stated: "It's got to depend on whether it's solid, if too high it will fall over and you're in (for)property damage. Also blocks out the breeze".

Perception of Noise Barriers

The concrete durisol barrier is one of several types of noise barriers. One objective of the survey was to determine people's perceptions of barriers in general. Therefore, the issue of barrier type was further investigated by showing the respondents three different sets of photographs to determine their aesthetic, colour, and design preferences.

The first set of photographs contained pictures of a concrete, wood, and steel barrier. The second set of photographs consisted of four coloured walls; namely: medium brown, light grey, pacific turquoise, and gulf green. The last set had pictures of a horizontal, vertical, and fan shape barrier. The photographs were arranged differently for each interview to prevent the order in which the photographs were seen from influencing the respondent's selection.

Aesthetic Preference

The respondents chose the barrier which they liked the best and the worst in terms of overall appearance from photographs of a grey concrete, brown timber, and green steel barrier. The percentages choosing each barrier type as best liked by zone are presented in Table 16.

Table 16

Barrier Like Best In Terms of
Overall Appearance By Zone

Barrier Type	Zone Percentage			Total
	I	II	III	
Wood	41.5	37.1	25.0	35.8
Concrete	31.7	30.1	28.8	30.4
Steel	24.4	26.0	38.5	28.5
Don't know	2.4	6.8	7.7	5.3
Total	100.0	100.0	100.0	100.0
Number of Respondents	82	73	52	207

There appears to be a slight preference for the wooden barrier as over one-third (35.8%) of the respondents chose it compared to 30.4% and 28.5% who chose the concrete and steel barriers, respectively. Note that approximately two-fifths of both the Zone I and II respondents chose wood and approximately one-quarter chose steel as their first choice.

The opposite is true among Zone III respondents. One-quarter (25.0%) of the Zone III respondents chose wood and almost two-fifths (38.5%), steel. These zonal differences are not statistically different nor are the differences in material liked best for the Zone I respondents.

The above analysis described the barrier liked the best. The respondents also indicated the one they liked the least. In order to simplify this data, scores were calculated. The values 1, 2, and 3 were assigned to represent least liked, second choice, and best liked respectively. Those who did not know which barrier they liked best or least were excluded. As shown in Table 2, Appendix II, each barrier type received approximately the same score, that is, 2.0.

Perception of Most Effective Barrier

The respondents chose the barrier they perceived as most and least effective from photographs of a grey concrete, wood timber, and green steel barrier. Over half (55.6%) of the respondents perceived the concrete barrier, the one they have in their area, as the most effective. See Table 17 for details. One-fifth (19.8%) could or would not make a judgement, 17.4% chose the wood barrier, and one-fourteenth (7.2%) chose the steel barrier. Comments such as "I'm not an engineer. How would I know?" exemplified many of the don't know responses. No statistical differences by zone were found but more of the Zone I respondents perceived concrete as most effective.

Table 17
Barrier Perceived As Most Effective By Zone

Barrier Type	I	Zone Percentage		Total
		II	III	
Concrete	58.5	50.6	57.7	55.6
Wood	15.9	19.2	17.3	17.4
Steel	8.5	5.5	7.7	7.2
Don't know	17.1	24.7	17.3	19.8
Total	100.0	100.0	100.0	100.0
Number of Respondents	82	73	52	207

Scores based on the respondents' answers to which barrier they believed was least and most effective and second most effective are illustrated in Table 3, Appendix II. The higher the score, the more effective the residents believed the barrier to be. The scores for the concrete, wood, and steel barriers were: 2.6, 1.8, and 1.6, respectively.

Design Preference

The respondents looked at photographs of a vertical steel, a horizontal steel, and fan shaped barrier and were asked to choose the barrier they liked best and least in terms of design and/or construction. The interviewers stressed that appearance was not a factor, only the design and/or construction.

As shown in Table 18, half the respondents (50.3%) chose the horizontal barrier as their first choice. Approximately, one-fifth (22.2% and 20.3%) chose the fan shaped and vertical barriers, respectively as their first choice. The difference by zones was not statistically different, but significantly more of the respondents in Zone I preferred the horizontal barrier than the fan shape or vertical ones.

Table 18
Barrier Like Best In terms of Design
By Zone

Barrier Type	I	Zone		Total
		II Percentage	III	
Horizontal	47.6	53.4	50.0	50.3
Fan Shaped	26.8	16.4	23.1	22.2
Vertical	20.7	19.2	21.2	20.3
Don't know	4.9	11.0	5.8	7.2
Total	100.0	100.0	100.0	100.0
Number of Respondents	82	73	52	207

The scores calculated for design preference, presented in Table 4, Appendix II, indicated a strong preference for the horizontal design. The scores for the horizontal, vertical, and fan shaped barriers were: 2.5, 1.9, and 1.6, respectively.

Colour Preference

One-third (33.8%) of the respondents indicated medium brown was the best colour for noise barriers. One-fifth of the respondents each chose light grey (22.2%); gulf green (21.7%); and pacific turquoise (20.8%) as the best colour. The photographs of the different colour were all of a horizontal steel barrier. The percentages by zone are presented in Table 19.

Table 19
Colour Preference By Zone

Colour	Zone			Total
	I	II	III	
	% indicating colour as best liked			
Medium brown	25.6	38.4	40.4	33.8
Light grey	24.4	16.4	26.9	22.2
Gulf green	28.0	19.2	15.4	21.7
Pacific turquoise	22.0	21.9	17.3	20.8
Number of Respondents	82	73	52	207

A higher percentage of Zone II and III respondents (38.4% and 40.4% respectively) chose brown as the best liked barrier colour as compared to one-quarter (25.6%) of the Zone I respondents. About the same percentage of Zone I (24.4%) and Zone III(26.9%) respondents chose grey as best liked as compared to 16.4% of the Zone II respondents. Gulf green is preferred by more Zone I respondents (28.0%) than Zone II and III (19.2% and 15.4%, respectively). About one-fifth of the respondents in each zone indicated pacific turquoise as their first choice. No difference in colour preference was found among Zone I respondents.

The age of the respondent had no effect upon their colour choice. The only colour influenced by a sex difference was pacific turquoise. More males (28.0%) than females (14.0%) chose this colour as the best one for noise barriers.

The noise barrier in the respondents' area is unpainted concrete and thus, a light grey. As stated previously, one-fifth (22.2%) of the respondents chose it as the best colour for noise barriers. However, two-fifths(39.1%) chose it as the least liked colour. The percentage of respondents choosing gulf green, brown, and pacific turquoise as least liked were: 23.7%; 18.4%; and 17.4%. There were no significant differences by zone in the respondents' ranking of the light grey colour.

A score, ranging from 1 to 4, was calculated for each colour. The closer the score is to 4, the more preferred the colour is. As shown in Table 5, Appendix II, brown received the highest score, 2.8, and green, the lowest, 2.3. Pacific turquoise and gulf green both had a score of 2.5.

Attitude To Noise Barriers

One objective of the study was to determine the residents' attitude to noise barriers being built along the Highway. Half (49.3%) of the respondents use the Highway more than once a week, one-fifth (20.3%) travel on it once a week and 30.4% use it rarely or never.

The respondents were asked what effect the barriers have on the Highway and the area around them and the reasons for their opinion. Approximately twice the percentage of respondents (39.3%) stated noise barriers made the Highway less attractive than reported they made it more attractive (19.9%). One-third (34.5%) believed barriers had no effect on the appearance of the Highway.

The reasons given, as shown in Table 20, refer mainly to either the appearance of the barriers themselves or the effect of the barriers on the highway. Over one-quarter (28.5%) of the respondents stated barriers serve a functional purpose or that drivers do not and/or should not pay attention to barriers.

Table 20
Reasons For Attitude To Noise Barriers

Reasons	%
Serve functional purpose	28.5
Make highway less attractive	20.8
Barriers are unattractive	18.8
Barriers are attractive	13.5
Make highway more attractive	8.7
Benefit community	2.9
No opinion	6.8
Total	100.0
Number of Respondents	207

One-fifth (20.8%) of the respondents claimed barriers detracted from the scenery of the highway. Comments of this type included: "It used to have a more soft, natural appeal"; "We've lost the beauty of the highway and scenery"; and "Can't look into people's gardens or houses". Another fifth (18.8%) of the respondents described the barriers themselves as "ugly, unappealing, boring, concrete jungle, like a tunnel".

On the positive side, 13.5% of the residents, reported the barriers were attractive structures providing continuity to the Highway. Approximately one-twelfth (8.7%) believed the barriers made the Highway more attractive by covering backyards. Comments included: "Sooner see a brick wall than a messy backyard" and "Gives a clean appearance to the highway".

DISCUSSION

The research findings indicate the installation of the noise barrier has had mainly positive effects upon the neighbourhood. The findings are discussed in terms of what effects the residents believe the barrier has had and their suggestions for changes in the barrier.

Impact of Barrier

The barrier appears to have reduced the level of noise problems in the study area. At the time of the survey just under two-fifths of the respondents were quite, very or completely satisfied with the level of noise in general from Highway 401. A similar percentage were only somewhat satisfied or somewhat dissatisfied and the remaining one-quarter were dissatisfied.

While overall dissatisfaction with the level of highway noise was relatively low, a substantial minority (42%) of the respondents were dissatisfied with the level of highway noise outside when asked specifically about noise in this area. The level of both general dissatisfaction and dissatisfaction with noise outside their house was independent of distance from the Highway.

The majority of respondents (63%) said that noise was a problem prior to erection of the barrier. In Zone I, the area adjacent to the Highway, 75% recalled noise as a problem. When interviewed, 78% of these same respondents and 91% in Zone I, said construction of the barrier had eliminated the noise-related problems either completely or somewhat.

The procedure of asking about perceptions now and prior to the erection of the barrier provides implicit evidence that the residents' dissatisfaction with the level of Highway noise has been reduced.

The respondents believe the effects of the barrier on their neighbourhood have been generally positive and more of the Zone I respondents generally reported positive effects. Over three-fifths of the respondents said the overall situation was better now than before the noise barrier was installed. Two-thirds said the amount of traffic noise from Highway 401 was better (less), half reported less noise in some sections of their house, almost half have more visual privacy in their yard, over two-fifths, less dust and dirt settling on their yard and approximately one-quarter report the situation concerning fumes from traffic on the Highway, vibrations due to traffic, and salt spray from the Highway are better.

The percentage of Zone I residents who report the situation is better is considerably higher than for the whole sample. For example, seven out of eight of the Zone I residents believe the overall situation is better and only 1% say it is worse as a result of the barrier.

Three-fifths of the Zone I residents reported that the barrier had created unanticipated benefits. The major benefit was increased visual privacy in their backyard. Other benefits mentioned include a reduction in noise, reduced wind and snow drifts, less dust and dirt, less salt spray, etc.

The respondents were also asked if they believed the barrier was worthwhile and how satisfied they were with it. One-third indicated it is very worthwhile and almost half, (46%) said it is somewhat worthwhile. The Zone I residents believed the barrier to be more worthwhile than those living more distant from it since 91% of the Zone I residents said it was somewhat or very worthwhile. Overall, only one-seventh of the residents believed the barrier was not worthwhile.

When asked if they were satisfied with the barrier, just over half, (53%) said they were very, quite or completely satisfied, almost two-fifths were neither satisfied or dissatisfied, and one-tenth were dissatisfied. When asked why they were satisfied or dissatisfied with the barrier, half said because of the reduction in noise, one-seventh that the noise level had not been reduced enough, and one-eighth said the noise either did not change or increased.

More respondents believe the barrier was worthwhile than were satisfied with it. This suggests that they approve of what has been done but believe there is still room for further improvement.

The 19 residents who were dissatisfied with the barrier were also more dissatisfied with highway noise in general, highway noise while talking in the house, while reading or relaxing inside, and while sleeping. They were not significantly more likely to be dissatisfied with other neighbourhood characteristics related to the highway such as visual privacy, vibrations, fumes, and salt spray than those who were satisfied with the barrier. It is probable that in any area where a noise barrier is erected, there will be a group of residents who remain dissatisfied regardless of what is done.

The barrier caused problems for just over two-fifths of the Zone I and one-fifth of all the residents. The major problems reported by the Zone I residents were site specific. That is, they were due to the way in which the barrier was erected or maintained. A major source of irritation appears to be a strip of land between the barrier and the edge of the residents' property. In some areas a fence extends along the property line leaving a narrow unused and unmanaged area on the inside of the barrier. Future maintenance of this strip warrants investigation. The other objections to the barrier were due to a dislike for either its appearance or the psychological feeling of confinement that it creates.

Overall, the residents approve of the barrier and those most intimately involved with it, that is, the Zone I residents, approve of it most strongly. The sound barrier has not solved all of the sound problems and has created a few site specific annoyances but it generally is considered to be both effective and worthwhile.

Barrier Characteristics

The residents' opinions on the height, colour, and design of the sound barrier were investigated in order to provide information useful in designing barriers in other areas.

Height

The height of the barrier was investigated by means of three questions. The respondents were asked whether they had any suggestions for improving the barrier based upon its appearance from the residential side in terms of its height. Three-fifths believed the barrier should stay at four metres while one-quarter wanted it higher. Most of the remainder did not have an opinion and 3 persons believed it should be lower. Only 5 respondents mentioned changing the height to improve its appearance from the highway side. They all wanted it raised.

When asked if they would approve or disapprove if this barrier were built another metre higher, just over half approved, one-quarter disapproved and the remaining quarter did not have an opinion. Of those who approved of building the barrier higher, the majority did so because they believed it would further reduce noise.

The responses indicate that when confronted with the choice of increasing the height of the barrier by one metre, over half of the respondents would do so even though they might not want it higher from the point of view of appearance. A higher barrier would draw some level of opposition from approximately one-quarter of the respondents. Some respondents apparently interpreted the question to imply the present barrier would be increased by one metre and were opposed to such a change.

On the basis of the findings from the above three questions concerning height, the majority of the residents are satisfied with the present height of 4 metres but would approve of a 5 metre barrier if it made the barrier more effective.

Colour

In order to determine the preferred colour for noise barriers, three questions were asked. Two involved the colour of the existing barrier and the third, the colour of noise barriers in general.

When asked about the colour of the present barrier, as seen from the residential side, half wished to have it remain its present light grey colour, approximately one-third preferred a change, and the remainder had no opinion. Of those desiring a change, almost half stated a preference for green, one-quarter for brown, and the remainder chose some other colour. This suggests that at least half are satisfied with the present grey colour. Nine of the respondents who volunteered ways for improving the appearance of the highway side of the barrier suggested that the colour be changed to green, 2 to brown, and 1 to turquoise.

When asked to choose from among four different coloured photographs of horizontal, steel panels, the respondents indicated a preference for a medium brown. One-third said medium brown was the best colour compared to approximately 22% who chose each of three other colours, light grey, gulf green, and pacific turquoise.

Two-fifths of the respondents liked the light grey colour least compared to just under one-quarter who disliked the gulf green, and fewer than one-fifth who disliked the medium brown and pacific turquoise the most.

It is difficult to draw conclusions. While grey is the most frequently disliked colour when shown photographs, half the residents were in favour of retaining the grey colour of the existing barrier. Those who indicated changing the colour of the existing barrier chose a green colour. However, when asked for their opinion of the best colour for barriers in general, a slight preference for brown was evident.

Appearance

Slightly more residents indicated they prefer the overall appearance of a wood barrier to a concrete or steel one. The percentage preferring each was as follows: wood, 36%; concrete, 30%; and steel, 29%. The above preference differs substantially from their perception that concrete is more effective than the others. Over half (56%) believe concrete is the most effective of the three types of barriers. This compares with 17% who believe wood and 7% who believe steel is the most effective.

A barrier with horizontal panels was chosen over other designs by half of the respondents. The fan design was preferred by 22%, and a vertical design by 20%. The preference for a horizontal design may be influenced by the existing barrier which is of the type.

On the basis of the respondents' answers to the questions on barrier height, colour, and appearance, we are inclined to conclude that no combination of height, colour, and material will be accepted by all residents. The existing grey concrete, horizontal design appears to be generally acceptable. A substantial number of residents would like a brown, wooden barrier but only a few believe it would be as effective as a concrete barrier. The desire for landscaping on both the residential and highway side of the barrier is worthy of consideration if plants can survive the salt spray and highway fumes and if the cost of planting and maintenance is not excessive.

APPENDIX I
QUESTIONNAIRE

1 2 3

(1) 4

I'm _____ from InfoResults Limited. A few days ago we mailed you a letter about a survey we're doing in your area for the provincial government. It's about people's attitudes towards their neighbourhood. I would like to ask you (required respondent) a few questions.

1 a) What year did you first move into this house? 19 _____

5

b) If 1978: Did you move in before September 1978 or after?

Before Sept. '78
After or during

1 2 6

2. Do you (or your family) own or rent this house?

family-related=owners	Own	1	7
non-family (borders)=renters	Rent	2	
	Other	3	

3 a) At any point in time have you (or your family) ever considered moving away from here?

----- Yes
(go to q. 4) ----- No

1 2 8

b) Why did you consider moving? (If non-noise related, ask:
For any other reasons?)

9

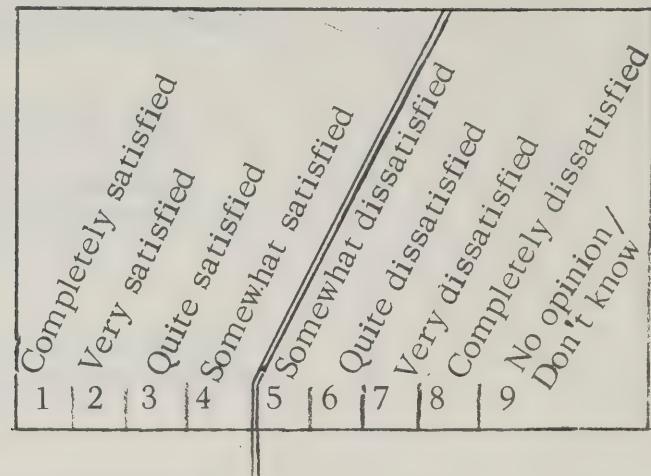
--- If noise-related, ask 3c:

c) Why didn't you move?

10

4. I'd like to get your opinion on various features of your neighbourhood.

On this sheet (give respondent answer sheet) you will see there are 8 different answers ranging from completely satisfied to completely dissatisfied. In between you see very, good, and somewhat satisfied and very, good, and somewhat dissatisfied. Now I'm going to read a statement and I'd like you to choose the answer from the sheet which best describes how satisfied you are with this feature of your neighbourhood. Let's go through the first one together.



a) the amount of noise from the 401..... 1 2 3 4 5 6 7 8 9 11

b) the amount of dust & dirt that settles on your yard or balcony..... 1 2 3 4 5 6 7 8 9 12

c) the amount of noise from the 401 when you are trying to sleep..... 1 2 3 4 5 6 7 8 9 13

d) the amount of noise from the 401 when you are talking to people in your house..... 1 2 3 4 5 6 7 8 9 14

e) the amount of vibrations on your windows or dishes from traffic on the 401..... 1 2 3 4 5 6 7 8 9 15

f) the amount of noise from the 401 when you are using your yard or balcony..... 1 2 3 4 5 6 7 8 9 16

g) the amount of noise from the 401 when you are reading or relaxing in your house 1 2 3 4 5 6 7 8 9 17

h) the amount of fumes from traffic on the 401 1 2 3 4 5 6 7 8 9 18

i) the amount of salt spray or residue from the highway in the winter on your home or yard 1 2 3 4 5 6 7 8 9 19

j) the amount of visual privacy that you have from traffic on the 401..... 1 2 3 4 5 6 7 8 9 20

k) the amount of noise from airplanes..... 1 2 3 4 5 6 7 8 9 21

5. About a year ago, the Province put up a noise barrier along the 401 in your neighbourhood. The barrier is 4 metres, that is, 13 feet high and is made of concrete.

a) Are you aware of this barrier in your neighbourhood?

Yes
(terminate) No

1
2

22

b) Did you live in this house BEFORE this noise barrier was put up?

Yes, before
(go to q. 12) No (during or after)
green

1
2

23

6 a) Before the barrier was erected, was noise from the 401 a problem for you?

Yes, a problem
(go to q. 7) {No, not a problem
Can't say

1
2
3

24

b) How was the noise a problem for you before the barrier was put up? How did the noise bother you? (Probe: how affected lifestyle).

25

26

c) Did the noise barrier eliminate these problems?
(Probe: to what extent?)

specify: _____
Yes, completely
Yes, somewhat
No, still problems

1
2
3

27

7 a) What did you expect from this noise barrier at the time it was put up?

28

29

If no expectations, go to 8

b) Have these expectations taken place?

30

8 a) Has the noise barrier caused any problems that you are aware of?

(ask 8 b)
(go to q. 9) {Yes
No
Don't know

1
2
3

31

8 b) What problems did the noise barrier cause?

32

33

9. What benefits did you get from the noise barrier that you never expected to get?

34

35

10. I'd like you to compare the situation now with the situation before the noise barrier was put up a year ago. Would you say the barrier has made (read categories) better, worse or no difference. Is it much or slightly (better or worse)?

a) the amount of dust and dirt that settles in your yard

	Much better	Slightly better	No difference	Slightly worse	much worse	Can't say	
	1	2	3	4	5	6	
a)	1	2	3	4	5	6	36
b)	1	2	3	4	5	6	37
c)	1	2	3	4	5	6	38
d)	1	2	3	4	5	6	39
e)	1	2	3	4	5	6	40
f)	1	2	3	4	5	6	41
g)	1	2	3	4	5	6	42
h)	1	2	3	4	5	6	43

b) the amount of fumes from traffic on the 401

c) the amount of privacy in your yard from traffic on the 401

d) the amount of noise from the 401

e) the amount of vibrations on windows/dishes from 401 traffic

f) the amount of salt spray or residue from the 401 in winter

g) the amount of noise in some sections of your house

h) the overall situation

Probe: Anything else? _____

11. I'd like to know how the barrier has affected your lifestyle.

a) Have you used your front or back yard more, less or the same since the barrier was put up?



{ More
Less
Same

1

2

3

44

b) If more or less, ask : Why?

45

Start here if 'no' to q. 5 b

12. a) I have three photographs of various noise barriers. I'd like you to tell me which one you think looks the BEST as far as overall appearance?

Comments:	SET I	Concrete	1	46
		Wood	2	
		Steel	3	
		Don't know / can't choose one	4	

b) Which one do you think looks the WORST as far as overall appearance?

Comments:	SET I	Concrete	1	47
		Wood	2	
		Steel	3	
		Don't know / can't choose one	4	

c) Code second choice:

SET I	Concrete	1	48
	Wood	2	
	Steel	3	
	Don't know	4	

13. a) Which one do you feel is the most effective in reducing noise?

Comments:	SET I	Concrete	1	49
		Wood	2	
		Steel	3	
		Don't know / can't choose one	4	

b) Which one do you feel is the least effective in reducing noise?

Comments:	SET I	Concrete	1	50
		Wood	2	
		Steel	3	
		Don't know / can't choose one	4	

c) Code second choice:

SET I	Concrete	1	51
	Wood	2	
	Steel	3	
	Don't know	4	

14. a) Looking at these photographs (Set II) which one do you like BEST in terms of colour for noise barriers? (code as 1) (best)

Comments:	Medium brown.....	1	2	3	4	52
	Light grey	1	2	3	4	53
	Pacific turquoise	1	2	3	4	54
	Gulf green	1	2	3	4	55

b) Which one do you like LEAST? (Code as 4)

c) Which colour (name the two remaining ones) do you like better? (Code one like better as 2 and then code third choice as 3).

15 a) Looking at these photographs (Set III), which one do you like BEST in terms of barrier design and/or construction? Not from an appearance point of view--only design.

Horizontal	1	56
Vertical	2	
Fan shape	3	
Don't know / can't choose	4	

b) Which one do you like LEAST in terms of barrier design and/or construction? Not from an appearance point of view--only design

Horizontal	1	57
Vertical	2	
Fan shape	3	
Don't know / can't choose	4	

c) Code second choice:

Horizontal	1	58
Vertical	2	
Fan shape	3	
Don't know	4	

16. Looking at the noise barrier from this side of the highway, do you have any suggestions about how the barrier could be improved? For example, would you

a) change the colour or leave it (specify colour preference: _____)	Change colour Leave it Don't know/no reply	1 2 3	59
b) do some landscaping (specify: _____)	Landscaping No landscaping Don't know/no reply	1 2 3	60
c) build it higher or lower or leave it at 4 metres, that is 13 feet.	Higher Lower Leave at 4 metres Don't know/no reply	1 2 3 4	61
d) build it thinner or thicker or leave it	Thinner Thicker Leave it Don't know/no reply	1 2 3 4	62
e) change the design & structure specify: _____	Change design Leave it Don't know/no reply	1 2 3	63

17 a) This barrier is 4 metres high (13 feet). Would you approve or disapprove if this barrier were built another metre, that is, 3 ft. higher?



{ Approve
Disapprove
(go to q. 18) Neither approve
nor disapprove

1
2
3

64

b) Why would you (read answer-approve or disapprove)?

65

18. Have you seen what this barrier looks like while driving on the 401?



- Yes
(go to q. 20) No

1
2

66

19. When you are on the 401, do you have any comments about how this barrier looks or how it could be improved?

(Probe: colour, landscaping, height, design, etc.)

67

68

69

70

20. a) In general, how satisfied are you with this barrier? (Hand sheet)
Please give me an answer from this sheet.

Completely satisfied
Very satisfied
Quite satisfied
Somewhat satisfied

1
2
3
4

71

Somewhat dissatisfied
Quite dissatisfied
Very dissatisfied
Completely dissatisfied

5
6
7
8

Don't know/no opinion

9

b) Why are you (read answer) with the noise barrier?

72

21. How worthwhile do you think this noise barrier has been?

Has it been (read each, except no opinion)

Very worthwhile
Somewhat worthwhile
Not worthwhile
No opinion/no reply

1
2
3
4

73

22. Now I'd like to ask you about highway 401 in general. On the average, how many times a week do you travel on the 401?

Read: Never	1	74
Rarely	2	
Once a week	3	
More than once a week	4	

23 a) Barriers are being built along the 401 in Toronto. You may have seen them in other areas. In your opinion, do these barriers make the 401 and the area around it:

Read: More attractive	1	75
Less attractive	2	
Neither attractive nor unattractive	3	
No opinion	4	

b) Why do you feel the barriers make the 401 (read answer above)?

76

24. Are you between:

Read: 18-24 years	1	77
25-34	2	
35-44	3	
45-54	4	
55-64	5	
65+	6	

25. May I have your phone number as someone may phone to verify I was here.

(ask last name if won't give #)

26. Do you have any further comments:

Thank you very much

Sex of Respondent:

Male	1	78
Female	2	

Zone

Zone I	1	79
Zone II	2	
Zone III	3	

Interviewer:

Brenda	1	80
Nancy	2	
Heather	3	
Mary	4	
Anita	5	
Other	6	

APPENDIX II
ADDITIONAL TABLES

Table 1

Level of Dissatisfaction With Neighbourhood Features
By Zone

Neighbourhood Features	Zone I			Zone II			Zone III			Total		
	A	B	C	A	B	C	A	B	C	A	B	C
Highway noise in general	39.1	36.6	24.4	39.7	35.6	24.6	28.9	46.1	25.0	36.7	38.6	24.7
Highway noise-talking in house	58.5	32.9	8.6	76.7	20.5	2.8	78.9	19.2	1.9	70.1	25.1	4.8
Highway noise-reading or relaxing in house	64.7	31.7	3.6	74.0	23.3	2.7	63.5	34.6	1.9	67.6	29.5	2.9
Highway noise-sleeping	37.8	28.1	34.2	49.3	28.7	21.9	32.7	30.8	36.5	40.6	29.0	30.5
Highway noise-outside	15.8	39.0	45.1	39.8	24.6	35.7	19.2	36.6	44.2	25.1	33.2	41.5
Visual privacy from traffic	76.8	14.6	8.5	94.5	4.1	1.4	88.4	9.6	1.9	86.0	9.6	4.4
Vibrations on windows/dishes	43.9	35.4	20.7	76.7	20.6	2.8	73.1	25.0	1.9	62.8	27.5	9.7
Fumes from highway traffic	31.7	39.0	29.3	61.6	28.8	9.6	57.8	27.0	15.4	48.8	32.3	18.9
Salt spray from highway traffic	34.2	41.5	24.4	56.1	27.3	16.5	51.9	32.7	15.3	46.4	34.2	19.3
Dust and dirt on yard/balcony	24.4	37.8	37.8	52.0	26.0	21.9	34.6	40.3	25.0	36.7	34.3	29.0
Noise from airplanes	81.8	17.0	1.2	72.6	20.6	6.9	65.4	25.0	9.6	74.4	19.8	5.3

A Percentage of respondents in each zone who were satisfied, that is, quite, very or completely satisfied.
The number of respondents in each zone were: 82, 73, 52 for zones I, II, III, respectively.

B Percentage of respondents in each zone who were somewhat satisfied, somewhat dissatisfied or did not state an opinion.

C Percentage of respondents in each zone who were dissatisfied, that is, quite, very or completely dissatisfied.

* The percentages may not add up to 100% due to rounding.

Table 2
Overall Appearance Preference Score of
Barriers By Zone

Type	I	Zone		Total
		II	III	
Concrete	1.9	2.0	2.1	2.0
Wood	2.2	2.0	1.8	2.0
Steel	1.8	2.0	2.1	1.9
No. of Respondents	80	68	48	196

Table 3
Perception of Most Effective Barrier
By Zone

Type	I	Zone		Total
		II	III	
Concrete	2.7	2.7	2.6	2.6
Wood	1.8	1.9	1.8	1.8
Steel	1.6	1.5	1.6	1.6
No. of Respondents	68	55	43	166

Table 4

**Barrier Design Preference Score
By Zone**

Type	I	Zone		Total
		II Percentage	III	
Horizontal	2.4	2.5	2.5	2.5
Vertical	1.9	1.9	2.0	1.9
Fan Shape	1.7	1.6	1.6	1.6
No. of Respondents	78	65	49	192

Table 5

**Barrier Colour Preference Score
By Zone**

Colour	I	Zone		Total
		II Percentage	III	
Brown	2.6	2.9	2.8	2.8
Pacific Turquoise	2.5	2.5	2.5	2.5
Green	2.6	2.5	2.3	2.5
Grey	2.3	2.0	2.4	2.3
No. of respondents	82	70	52	204

